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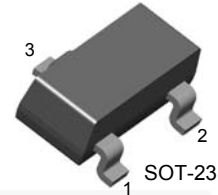
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MMBT3646 NPN Switching Transistor

Features

- NPN High Speed Switching Transistor
- Process 22



1. Base 2. Emitter 3. Collector

Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|-----------|----------------|
| MMBT3646 | 23 | SOT-23 3L | Tape and Reel |

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Value | Unit |
|----------------|--|------------|------------------|
| V_{CEO} | Collector-Emitter Voltage | 15 | V |
| V_{CES} | Collector-Emitter Voltage | 40 | V |
| V_{CBO} | Collector-Base Voltage | 40 | V |
| V_{EBO} | Emitter-Base Voltage | 5 | V |
| I_C | Collector Current (DC) - Continuous | 300 | mA |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |

Thermal Characteristics⁽¹⁾

Values are at $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Value | Unit |
|-----------------|--|-------|---------------------------|
| P_D | Total Device Dissipation at $T_A = 25^\circ\text{C}$ | 625 | mW |
| | Derate Above 25°C | 5 | mW/ $^\circ\text{C}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 200 | $^\circ\text{C}/\text{W}$ |

Note:

1. PCB size: FR-4 trace width is 50 mil / 25 mil / 15 mil, thickness: 2 OZ, minimum land pattern size.

Electrical Characteristics

Values are at $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------------|---|--|------|------|------|---------------|
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage | $I_C = 100\ \mu\text{A}, V_{BE} = 0$ | 40 | | | V |
| $V_{CEO(SUS)}$ | Collector-Emitter Sustaining Voltage ⁽²⁾ | $I_C = 10\ \text{mA}, I_B = 0$ | 15 | | | V |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C = 100\ \mu\text{A}, I_E = 0$ | 40 | | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E = 100\ \mu\text{A}, I_C = 0$ | 5 | | | V |
| I_{CES} | Collector Cut-Off Current | $V_{CE} = 20\ \text{V}, V_{BE} = 0$ | | | 0.5 | μA |
| | | $V_{CE} = 20\ \text{V}, V_{BE} = 0,$ $T_A = 65^\circ\text{C}$ | | | 3.0 | |
| h_{FE} | DC Current Gain ⁽²⁾ | $V_{CE} = 0.4\ \text{V}, I_C = 30\ \text{mA}$ | 30 | | 120 | |
| | | $V_{CE} = 0.5\ \text{V}, I_C = 100\ \text{mA}$ | 25 | | | |
| | | $V_{CE} = 1.0\ \text{V}, I_C = 300\ \text{mA}$ | 15 | | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage ⁽²⁾ | $I_C = 30\ \text{mA}, I_B = 3\ \text{mA}$ | | | 0.20 | V |
| | | $I_C = 100\ \text{mA}, I_B = 10\ \text{mA}$ | | | 0.28 | |
| | | $I_C = 300\ \text{mA}, I_B = 30\ \text{mA}$ | | | 0.50 | |
| | | $I_C = 30\ \text{mA}, I_B = 3\ \text{mA},$ $T_A = 65^\circ\text{C}$ | | | 0.30 | |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage ⁽²⁾ | $I_C = 30\ \text{mA}, I_B = 3\ \text{mA}$ | 0.73 | | 0.95 | V |
| | | $I_C = 100\ \text{mA}, I_B = 10\ \text{mA}$ | | | 1.20 | |
| | | $I_C = 300\ \text{mA}, I_B = 30\ \text{mA}$ | | | 1.70 | |
| C_{ob} | Output Capacitance | $V_{CE} = 5\ \text{V}, I_E = 0,$ $f = 1\ \text{MHz}$ | | | 5 | pF |
| C_{ib} | Input Capacitance | $V_{EB} = 0.5\ \text{V}, I_C = 0,$ $f = 1\ \text{MHz}$ | | | 8 | pF |
| t_{on} | Turn-On Time | $V_{CC} = 10\ \text{V}, I_C = 300\ \text{mA},$ $I_{B1} = 30\ \text{mA},$ $V_{CE(off)} = 3\ \text{V}$ | | | 18 | ns |
| t_d | Delay Time | | | | 10 | ns |
| t_r | Rise Time | | | | 15 | ns |
| t_{off} | Turn-Off Time | | | | 28 | ns |
| t_f | Fall Time | $V_{CC} = 10\ \text{V}, I_C = 300\ \text{mA},$ $I_{B1} = I_{B2} = 30\ \text{mA}$ | | | 15 | ns |
| t_s | Storage Time | | | | 20 | ns |

Note:

2. Pulse test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2.0\%$.

Physical Dimensions

SOT-23

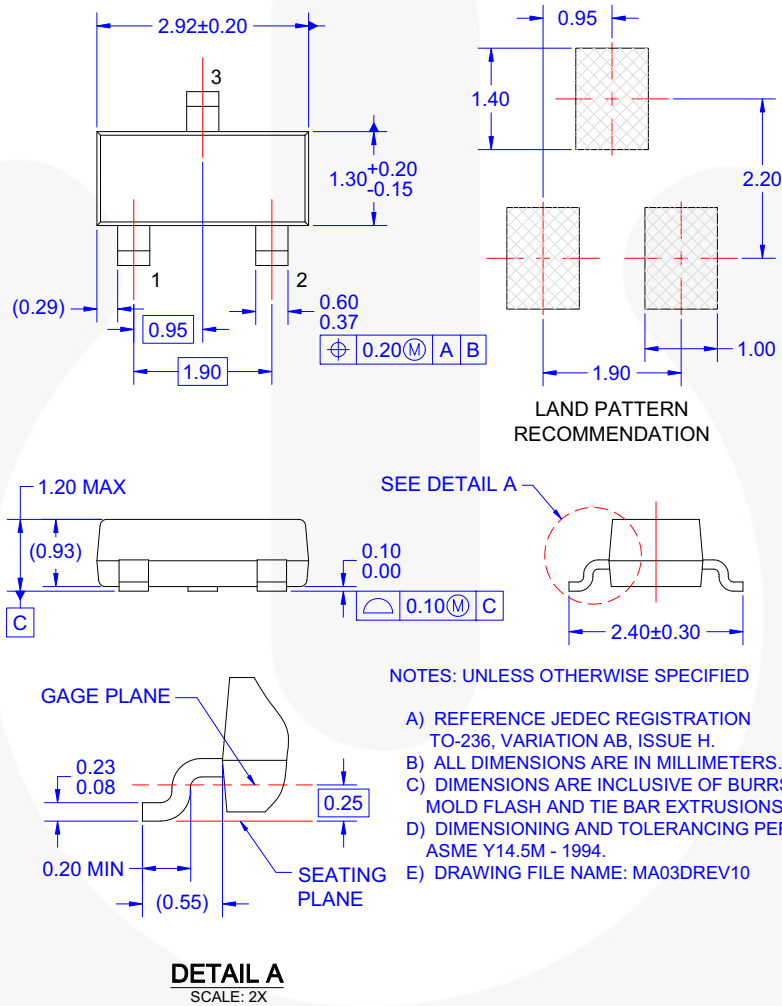


Figure 1. 3-LEAD, SOT-23, JEDEC TO-236, LOW PROFILE (ACTIVE)

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